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International Journal of Logistics Research and Applications

A Leading Journal of Supply Chain Management

ISSN: 1367-5567 (Print) 1469-848X (Online) Journal homepage: www.tandfonline.com/journals/cjol20

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To cite this article: Matthew J. Drake, Paul H. Pittman & Matthew Talbert (2024) Analysis of the incorporation of current trends in supply chain management within curricula, International Journal of Logistics Research and Applications, 27:12, 2642-2662, DOI: 10.1080/13675567.2023.2235295

To link to this article: https://doi.org/10.1080/13675567.2023.2235295

Published online: 12 Jul 2023.

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INTERNATIONAL JOURNAL OF LOGISTICS: RESEARCH AND APPLICATIONS
2024, VOL. 27, NO. 12, 2642–2662
https://doi.org/10.1080/13675567.2023.2235295

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Analysis of the incorporation of current trends in supply chain management within curricula

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ABSTRACT

The field of supply chain management is changing rapidly as new practices, concepts, and technologies are regularly implemented in practice to improve supply chain performance. The Association of Supply Chain Management (ASCM) publishes an annual list of the top 10 trends in supply chain management. Academic programmes must keep their curricula current to prepare students adequately to enter this dynamic field. We conducted an international survey of supply chain management academic programmes to determine the extent to which the current trends are covered in their curricula. Results showed that many trends are covered as at least a major topic in one course in most programmes, but some trends are not as pervasive. We provide recommendations for academic programmes looking to incorporate these top trends into their curricula.

ARTICLE HISTORY
Received 1 February 2023
Accepted 6 July 2023

KEYWORDS
Supply chain management; curriculum design; pedagogy; supply chain trends; curricular innovations; AACSB accreditation

Introduction

The attention and focus on supply chain management has never been greater than it is currently. With advancements resulting in more transparency in the supply chain combined with major global disruptions including those caused by the COVID-19 pandemic, daily discussion of supply chains has become commonplace in the popular media and households around the world. The result has been an increase in demand for supply chain talent, an increase in number of students pursuing careers in supply chain management (Delgado and Mills 2018), a predicted gap of 2.4 million unfilled supply chain positions between 2018 and 2028 (Lebovitz 2021), and a robust continued growth in salaries and compensation with a median of just under $100 K (ASCM 2023) for the field of supply chain management. The composition structure for supply chain professionals continues to change rapidly with overall compensation for almost half of professionals increasing by more than 8% in 2022 along with relative salary parity where women who have spent less than 20 years in the field have earned on par or more than their male counterparts in recent years (ASCM 2023).

Efforts to improve supply chain performance have resulted in new approaches and innovations expanding the field. The types of jobs demanded in the growing field of supply chain management and the knowledge and skills needed to be successful are changing just as rapidly (Delgado and Mills 2018). While topics traditionally covered in supply chain curricula such as demand forecasting, production scheduling, inventory management, and project management remain important, knowledge of best practices, technology expertise, and risk management are also top technical skills employees need for career success (ASCM 2023). Preparing future supply chain professionals for

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these demanding and well compensated positions requires re-examining and adjusting supply chain curricula. This provides fertile opportunity for new research as well as the need to expand supply chain curricula to better prepare students for their rapidly evolving profession.

The purpose of this paper is to benchmark the current status of supply chain education to determine how future supply chain talent is being prepared with the knowledge and skills most demanded in the field of supply chain management. We conducted an international survey of undergraduate and graduate supply chain programmes to assess the extent to which they cover the top trending topics in supply chain management (James 2021). The results provide an empirical assessment of current state of how the education field is preparing their students on these important subjects in supply chain and operations management including both the depth and breadth of those subjects covered. Recommendations on how courses and programmes can include these important topics are also provided.

Literature review

The concept of supply chain management was introduced in the early 1980s (Melnyk and Seftel 2016) with the term having first been coined in 1983 (Laseter and Oliver 2003) and has grown in prominence ever since, but its foundation traces back to the origins of business itself. While some trace supply chain management back to Frederick Taylor (Taylor 1911), many attribute Henry Ford (Ford and Crowther 1926) with the real understanding of supply chains and the importance of managing them effectively. In his book *Today and Tomorrow*, Ford and Crowther (1926) details how their supply chain was managed from mining of ore to delivering the finished vehicle to the owner in only eighty-one hours. Organisations have always had the need to forecast demand, plan production, procure parts and materials, manage and store inventory, and distribute products to customers; but coordination and integration of these activities was not feasible before the development of business enterprise and communication information systems in the latter half of the twentieth century (Drake 2012). These information systems and resources have been referred to as part of the glue holding together extended supply chains (Webster 1992). Enabled by information and technology solutions, supply chain management entails the coordination of traditional business functions within the organisation itself and across upstream and downstream members of the channel with the overall goal of serving the end consumer (Mentzer et al. 2001).

Given the roots of supply chain management as a set of disparate business functions managed largely independently for decades, the maturity of research on supply chain management education has followed an unsurprisingly similar fragmented trajectory. The earliest literature published about the pedagogy of business disciplines that ultimately fall under the purview of supply chain management was conducted in the tangential fields of operations research, management science, and decision sciences. These articles (e.g. Kendall (1958), Ackoff (1979), and Brightman and Noble (1979)), however, were mainly summaries of the experiences of distinguished academic experts whose opinions other instructors held in high esteem. While these articles certainly influenced a generation of educators in crafting their own courses and curricula, they read more as interesting commentaries rather than rigorous pedagogical research articles. One notable exception was with the introduction of industrial dynamics in Jay Forrester's landmark article (Forrester 1958) where he explained the bullwhip effect supply chains which led to the development of 'The Beer Game'-supply chain simulation in 1960. The few more rigorous pedagogical articles that were published during the early 1980s focused on individual functions within the supply chain such as the work by Zanakis et al. (1980), which examined the disconnect between teaching inventory concepts and theory and the issues related to managing inventory in practice.

At the same time as the concept of supply chain management grew from its infancy, pedagogical researchers began to study issues related to educating students about the integrated supply chain. In the late 1980s and through the 1990s, articles examined the incorporation of technology (Coye and Stonebraker 1994; Kwong, Hiranyavasit, and Fok 1989), experiential learning (LaForge and

McNichols 1989; Lovejoy 1998), and global issues (Starr 1997) into the production and operations management (as it was commonly called at the time) classroom. Sauter (1984) considered the efficacy of prerequisite courses taken at other institutions on students' performance in an operations management course at her institution. Desai and Inman (1994) identified antecedents and impediments to student interest in the production and operations management field. Researchers such as Coleman and Smith (1994) proposed topics that should be covered in core operations management courses and typologies to organise them.

By the late 1990s pedagogical research in the supply chain management field had matured significantly, but a watershed moment occurred at the turn of the century with the publication of a special issue in *Production and Operations Management* in Spring 2000 (Volume 9, Number 1). This special issue focused on teaching supply chain management and included articles covering curriculum design (Johnson and Pyke 2000), experiential learning (Mehring 2000), executive education (Vollmann, Cordon, and Heikkila 2000), global issues (Kopczak and Fransoo 2000), and the use of games (Chen and Samroengraja 2000) and technology (Campbell, Goentzel, and Savelsbergh 2000) to teach the concepts. This special issue brought much-needed publicity to the specific pedagogical considerations within the supply chain management field and notably referred to the field as 'supply chain management' instead of 'production and operations management,' which was more prominent at the time. The robust body of literature on supply chain management pedagogy owes a significant debt to this special issue and the spark it provided to motivate other researchers to examine the field.

Contemporary supply chain management pedagogical literature can be classified into three general categories: (1) classroom innovations (such as simulation activities and experiential projects) and case studies, (2) curricular strategies and innovations, and (3) practical skills required by employers. The first category of papers is of interest to instructors to offer resources for engaging the students in a particular portion of their course or helping them teach a particular topic. These papers look at the question of 'how' instructors should teach certain concepts and topics in the classroom. The second and third categories of papers are broader in their impact as they help to inform the design of courses or even entire degree programmes. They focus on the question of 'what' should be taught in the supply chain management curriculum.

Researchers have explored various approaches to assure the relevance of management education through various forms of collaboration between business schools and businesses (Xie and Steiner 2013). While the most prestigious business schools may be insulated to some degree from the external influences to assure the relevance of their curricula due to attracting top students who are sought-after job candidates and are offered the highest salaries upon graduation, most schools must assure their curricula are relevant in preparing graduates (Xie and Steiner 2013). Friga traced the history of management education into several eras since the first business school in 1881 (Friga, Bettis, and Sullivan 2003). Early business schools were corporate-based, emphasising practical business knowledge. Business schools during this era were criticised for being too vocational, prompting a shift towards more academic rigour during the 1950s. Friga, Bettis, and Sullivan (2003) refer to this as the shift from the corporate-based era to the faculty-based era, which then was subsequently criticised as being too academic, resulting in a shift towards a student-based era that emphasises delivering the most important content in the most efficient manner. Over the past three decades, business schools have been relatively slow to respond to industry's requirements to develop graduates with knowledge, skills, and competencies that align with the specific needs of management professional (Sauber, McSurely, and Tummala 2008). With increased competition in management education combined with corporate demands for relevant educational content, management education must offer programmes that provide both academic and business value (Grey 2002). Visich and Khumawala (2006) extend these general suggestions for management education into the operations and supply chain management field specifically by recommending that curriculum design should be informed by industry requirements for new professionals entering the field.

Organisations must manage their supply chains within dynamic competitive environments that are constantly evolving (Lorentz et al. 2013). One major source of these changes is the ongoing digital transformation in organisations precipitated by the adoption of Industry 4.0 technologies such as cyber-physical systems, artificial intelligence, and machine learning (Li 2020). This rapid clockspeed in the industry requires academic programmes to update their curricula to reflect these changes in the marketplace (Mohamed 2009). A recent study by Walden (2020), however, identified a significant gap between the content covered in supply chain management programmes related to the technology used in the industry and the expectations of employers based on entry-level job descriptions and requirements.

Quality supply chain management curricula are dynamic in nature, requiring continual updates and enhancements to align with current developments and innovations in the industry (Alipour and Newton 2019; Birou, Lutz, and Walden 2022). Supply chain management programmes should evaluate and monitor the changing job requirements in the industry and use these observations to inform the revision of their curricula (Radovilsky and Hegde 2012). Programmes that fail to adapt their curricula to include current industry and technology developments risk having the elements that differentiated their students in the marketplace become standard among all supply chain students, leaving them with fewer skills and attributes to stand out among their peers (Rawles et al. 2009).

Several approaches have been developed to assure supply chain management programmes' continued curricular relevance. While initial research on designing curriculum and developing practical skills in students tended to focus on the traditional business functions within supply chains, recent studies have emphasised the need to teach students holistic supply chain management focusing on the performance and success of the entire system instead of utilising a functional approach (Fawcett 2009; Gibson, Kerr, and Fisher 2016). Some firms have reported their frustration in needing to provide new supply chain hires with significant remediation in holistic supply chain decision-making concepts and techniques along with other skills they had expected them to learn in their academic programmes (Fawcett and Rutner 2014). Other researchers have advocated an approach to designing and updating supply chain curricula based on identifying practical skills and competencies that effective employees must possess (Sauber, McSurely, and Tummala 2008; van Hoek 2001). These skills include those specific to the supply chain and its constituent functions but also more general business skills such as problem solving and 'soft' skills such as negotiation, communication, time management, team-building, conflict resolution, and the ability to work and collaborate across cultures or organisations (Jordan and Bak 2016; Lutz and Birou 2013; Sohal 2013; van Hoek 2001).

A subset of supply chain management pedagogical research has focused on curriculum development and evaluating the content that is typically covered in supply chain courses. Researchers have employed a variety of data collection strategies to study these issues. One common approach has been to collect, review, and analyse course syllabi from a range of institutions to examine the coverage of topics in each course. Birou, Lutz, and Walden (2022) looked specifically at supply chain management course syllabi to determine topical coverage to determine gaps of coverage between supply chain management courses and needs determined in previous research. This study was limited to undergraduate courses in North America and was not intended to determine coverage across the entire supply chain management curriculum. Sinha, Millhiser, and He (2016) reviewed syllabi to determine the knowledge of specific supply chain topics that students possessed from their coursework when entering industry and compared these topics to the knowledge and skills required by entry-level job postings. Walden (2020) examined syllabi to evaluate the extent to which specific supply chain systems were covered in curricula. Studies that utilise this approach typically group courses into two binary categories: (1) courses that cover a specific topic and (2) courses that do not cover the topic. They do not differentiate courses by the *extent* to which the topic is covered. This distinction is important, however, because there is a significant difference between students hearing about a topic during one class session and studying that topic in depth for multiple

weeks or longer within a course. Other researchers such as Bernon and Mena (2013) conducted interviews with academics to study the design and coverage of their supply chain management curricula. This approach provides more depth of analysis but can only accommodate a relatively small sample size due to the intensive time required to conduct detailed interviews.

We selected a survey approach to conducting this study to address the drawbacks of the other methodologies previously used to study the content coverage within supply chain management curricula. Surveys enable the collection of more detailed information about all courses than relying on course syllabi would permit, and they can be completed for a wider sample size than detailed interviews would allow. Akalin, Huang, and Willems (2016) used surveys to examine the extent to which supply chain management content has replaced operations management content in business core courses. Lancioni, Forman, and Smith (2001) surveyed academics to investigate the extent to which the structure of an academic department was related to the expansion of logistics programmes to teach holistic supply chain management concepts and principles. van Hoek (2001) conducted a survey of industry professionals to determine the importance of various supply chain management topics and competencies for incoming employees. We used a similar structure as van Hoek (2001) to develop the scale of the questions in our survey to capture the extent of the coverage of each topic in curricula.

This paper examines the extent to which current supply chain trends are incorporated into supply chain management academic programmes. The remainder of the paper discusses the top trends in supply chain management selected for the research study followed by two sections describing the structure and presentation of the results of a survey of supply chain management academic programmes regarding the coverage of these topics in their courses. The paper concludes by offering suggestions for programmes to fill gaps in their curricula and proposing future research directions.

Association for supply chain management top 10 trends

There are numerous lists of top supply chain themes and trends published annually. Some of the most notable annual trend lists are published by consulting firms such as Gartner, McKinsey & Company, and KPMG (Gartner 2022; Henrich et al. 2022; KPMG 2021). While most top lists are comprised from the insights and expertise of the author(s) including publications such as Forbes (Banker 2022), Gartner's list is derived from a survey of 500 supply chain professionals (Gartner 2022). These lists are thought provoking and informative, yet they are limited to the perspective of the author(s) or could be biased towards the products and services offered by the publishers' firms. We selected the Association for Supply Chain Management's (ASCM) top 10 supply chain trends as the focus of this study because this list is developed annually and is comprised of topics across the widest variety of supply chain publications (James 2021). This list is a unique, purpose-built report for supply chain experts by supply chain experts that has been published annually since 2019. Unlike other top trend lists, the ASCM top 10 supply chain trends are based on the largest aggregated list of annual supply chain publications that is distilled through a rigorous analytical sensing process utilising a diverse team of international supply chain experts. As such, the list represents the broadest and most unbiased list based on current international publications. A more detailed explanation of the methodology used in creating the top 10 trends is discussed below.

The ASCM Top 10 Trends in Supply Chain Management list is developed annually using input from a variety of industry sources. A sensing group composed of 26 global supply chain experts from both industry and academia collectively aggregates all the published literature in supply chain management, extracts trends, and ranks these trends according to their impact on the field of supply chain management. The sensing process used is depicted in Figure 1.

For the top 10 trends list of 2022, which was the focus of this study, the group reviewed 125 citations and 2000 pages of research from 70 different sources published in 2021 (James 2021). It is

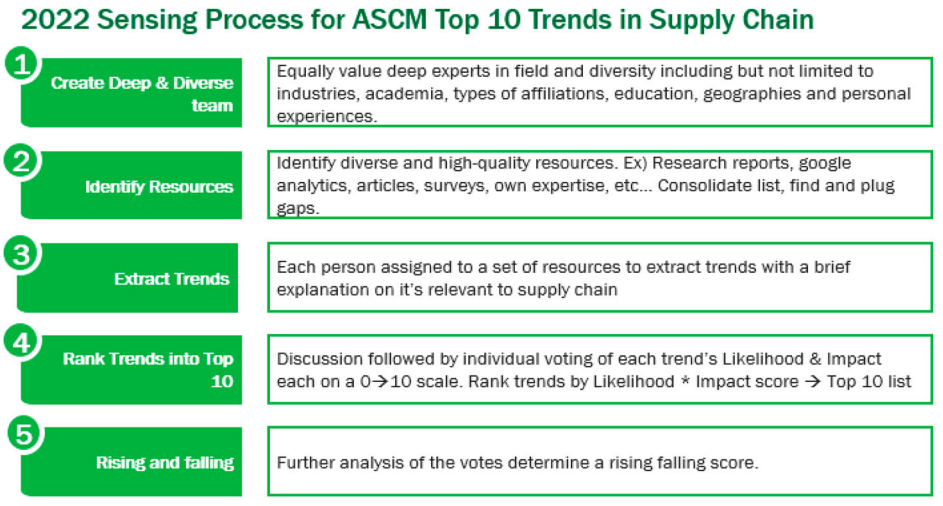

Figure 1. The 2022 sensing process for the ASCM Top 10 Trends in Supply Chain List. Source: www.ascm.org/ascm-insights/10-supply-chain-trends-to-watch-for-in-2022/.

important to note that the top ten trends list for 2022 was comprised from topics identified in a broad variety of global supply chain management publications in 2021.

A list of these trends (ranked from most-significant to least significant) and brief explanations of each are as follows:

1. Advanced Analytics & Automation – The implementation of artificial intelligence and machine learning for predictive and prescriptive analytics across the end-to-end supply chain. Advances in both algorithms and automation that revamp demand sensing, forecasting, planning, manufacturing, warehousing, and logistics.
2. Talent Management – The need for training existing employees, improving pay and benefits to retain employees, hiring talent with foundational data language and analytical skills, and increased investments in technology to improve the data systems to enable them to use the data.
3. Visibility – The investment in new technologies and automation that provide real-time access and end-to-end visibility of supply chain data to produce more responsive and competitive networks. These include visibility solutions across supply, demand, and financial data, to enable faster insights and better decisions.
4. Rise of E-Commerce – From planning to fulfilment, e-commerce shapes the way organisations structure their key priorities. Omni-channel fulfilment, enhanced visibility, and improved demand sensing create opportunities for competitive advantage.
5. Supply Chain Risk & Resilience – The capability to recover and resist the impacts of supply chain disruptions. Creating a resilient and flexible supply chain capable of adapting to instability by diversifying suppliers, production capabilities, and transportation processes is essential for long-term company survival.
6. Supply Chain Agility – Finding ways to increase responsiveness by moving to more variable cost structures, such as short-term contracts and more modular, later-point product differentiation. Agility is a reaction to the increasing uncertainty, shorter-term contracts, and continuously innovative culture prevalent in industry by allowing the organisation to be more flexible and respond more quickly to changes.
7. Digital Supply Chain – The use of technology to augment workflow and data collection as well as the adoption of technologies like blockchain, artificial intelligence, machine learning to enhance supply chain decision-making speed and quality.

8. Cybersecurity – The importance of protecting and recovering a firm's networks, devices, data, people, and programmes from any type of attack, damage, or unauthorised access. This includes investments in redundancy, firewalls, and advanced anti-hacking technology and skills.
9. Customer-Centricity – A focus on meeting and exceeding the demands of the individual consumer, as opposed to the immediate retailer or distributor customer. The shift of power to the consumer places pressure on companies to get products where they want them, when they want them, and at a price they want them. This includes leveraging creative technological solutions like demand planning technology and procurement analytics to adapt to consumer demand.
10. Artificial Intelligence (AI) – AI with machine learning systems foundational to integrating systems functions including planning, demand management and fulfilment. Improved insights into detecting demand changes earlier to allow upstream supply chain departments to respond with more agility and higher responsiveness.

For more detailed explanations refer to James (2021).

There were four additional trends considered that just barely missed the top ten trends, three of which were included in the top 10 list for 2021. In the process of determining the top 10 trends, topics tend to go through a pattern of emerging or rising in importance, while others decline or become less important over time. As related to supply chain management curriculum, emerging trends may be topical but lack the sustained importance to be integrated into course or discipline curriculum. These four additional trends merited inclusion as they came the closest to making the top 10 and should be monitored for future inclusion. As such, we included these topics in our research to assess whether supply chain academic programmes contained coverage of these key trends. These four trends were:

1. Demand Sensing – The ability to sense and capture real-time customer demand in the market.
2. Corporate Citizenship (ESG) – Environmental, global and social elements to supply chain will be important to sustainable supply chains of the future.
3. Demographic Changes – Changes caused by aging populations, declining birth rates, migration communities, and other factors that impact supply chains.
4. 3D Printing – The ability to create designs not possible in traditional manufacturing as well as parts that perform better, at a lower cost, and closer to the customer.

The aforementioned top trends served as framework for benchmarking current university programmes and curricula to assess their current status in educating supply chain management majors in these areas. While college curricula traditionally lag integrating emerging subject matter into the body of knowledge, education, and curriculum until there is widescale vetting and application in practice, it is now important to update curricula faster to assure graduating supply chain students are equipped with the latest knowledge to be successful in their careers. The ASCM list represents a well vetted and established set of subject matter worthy of integration and inclusion into supply chain management programmes. Students with knowledge and expertise in these areas can rapidly distinguish themselves as new employees, further enhancing the reputation of the programmes from which they graduated.

Survey structure and results

To evaluate the extent to which the current supply chain trends are covered in academic programmes, we administered a survey using Qualtrics over a period of approximately one month. We emailed a survey invitation with several reminders to 303 ASCM academic members. We also distributed the invitation to other academic networks, such as the Decision Sciences Institute and the mailing list for the Journal of Operations Management, in addition to the authors sharing

the survey through their academic networks. Almost all of the responses (>97%), however, were generated from the set of 303 ASCM academic members. The Institutional Review Boards (IRB) at the authors' institutions determined that IRB approval was not required for the distribution of this survey.

Before conducting any analysis, we cleansed the observations to ensure that only one response was included from each institution. When multiple responses from the same institution to a specific question, we kept the response that signified a higher amount of coverage of the topic based on the assumption that the instructors who rated the coverage higher than their colleagues knew about specific instances of how the topic was covered in the programme.

The final data set after cleansing for multiple responses from a single institution consisted of 76 responses about undergraduate programmes and 60 responses about graduate programmes. Many responses included information about both undergraduate and graduate programmes at the respondents' institutions. For undergraduate programmes, there were 45 responses from programmes based in the United States and 20 responses from other countries. At the graduate level, there were 38 responses from United States-based programmes and 15 responses from other countries. A total of 11 undergraduate responses and seven graduate responses did not specify their institution or its geographic location.

The survey contained seven questions, five of which were demographic and two related to the extent to which the current trends were covered in curricula. Some of these questions had multi-part responses. The demographic questions asked about the type of programme (e.g. supply chain management, operations management, logistics, industrial engineering, etc.), types of degrees offered, institution name, respondent title (e.g. faculty member, department chair or dean) and institution size. The questions on trends coverage in curricula were matrix questions, separating undergraduate and graduate coverage into two questions. The fourteen trends (ten from the 2022 list and the four that barely missed that list) were provided in the matrix, and the respondent had the option to select whether the trend has a dedicated course in the academic programme, is a major topic in at least one course, is briefly discussed in at least one course, or is not covered in any course. These options followed the approach used by van Hoek (2001) to determine the extent to which specific skills and abilities entry-level job seekers in the supply chain management field are required to possess. This spectrum of responses allowed us to evaluate the extent to which each trend is covered in an academic programme as opposed to the binary (covered versus not covered) approach commonly employed by researchers who review course syllabi to collect their data. The survey also included a link to the description of the trends in James (2021) so that respondents could be sure they understood the specific topics and concepts that each trend includes.

Figures 2 and 3 present the survey results for undergraduate and graduate programmes, respectively. These figures show that the coverage of different trends at both the undergraduate and graduate levels vary greatly. The highest-ranked trend on the list, Advanced Analytics & Automation, is covered at least as a major topic in one course in over 60% of undergraduate programmes and almost 80% of graduate programmes. The second-ranked trend, Talent Management, however, is covered at least as a major topic in one course in only 12% of undergraduate programmes and 22% of graduate programmes. Many of the trends are covered at least as a major topic in one course in over 50% of programmes at both the undergraduate and graduate levels. The only trends that are not covered to this extent are the aforementioned Talent Management, Cybersecurity, Demographic Changes, and 3D Printing. At the undergraduate level, Artificial Intelligence and Demand Sensing also fail to meet this threshold. Even more concerning is the fact that several trends such as Talent Management, Cybersecurity, Demographic Changes, and 3D Printing are not discussed at all in approximately 25–35% of undergraduate and graduate programmes. While some of these trends may not necessarily warrant significant coverage in all supply chain management curricula, brief discussion of these trends may suffice in the academic setting to raise students' awareness of the issues involved and their importance in practice.

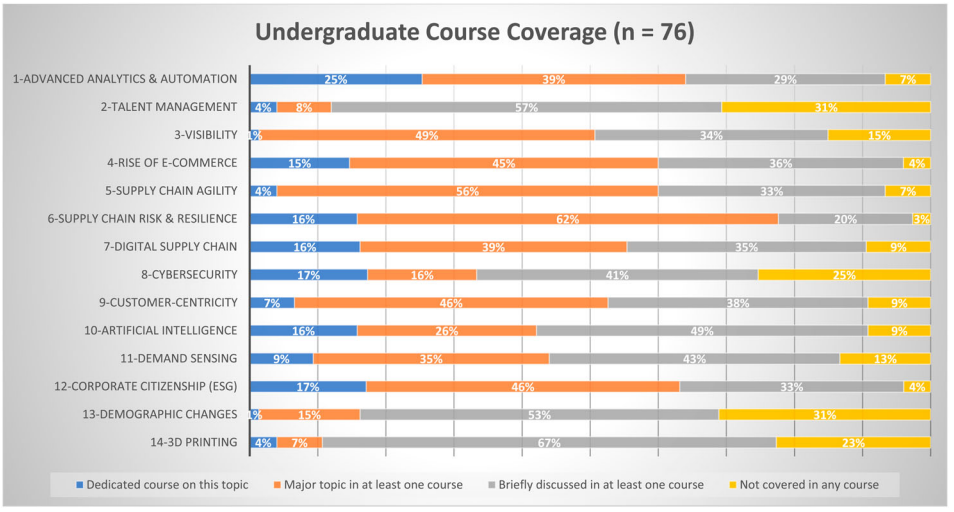

Figure 2. Coverage of supply chain trends in undergraduate programmes. The number in front of the trend name represents its ranking on the list with 1 being the highest-ranked trend.

Discussion and analysis of survey results

To allow for comparisons of the survey results between demographic groups and following the approach used by van Hoek (2001), we converted the responses of trend coverage in undergraduate and graduate programmes to a numerical scale with 4 representing 'dedicated course on this topic,' 3 representing 'major topic in at least one course,' 2 representing 'briefly discussed in at least one course,' and 1 representing 'not covered in any course.' We then assigned each observation to a mutually-exclusive programme type to enable comparisons between groups. At the undergraduate

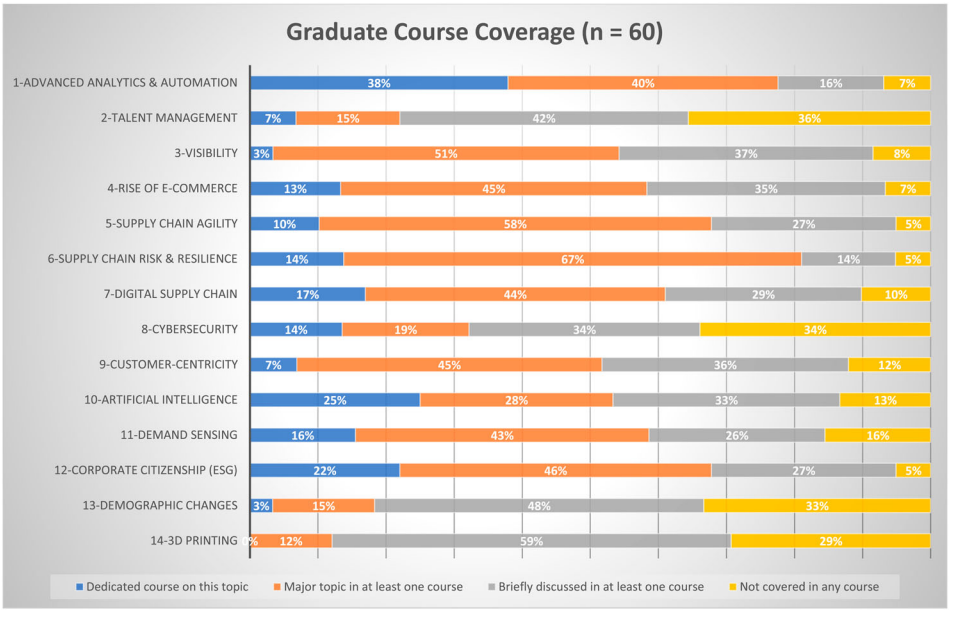

Figure 3. Coverage of supply chain trends in graduate programmes. The number in front of the trend name represents its ranking on the list with 1 being the highest-ranked trend.

level, programme types were institutions that only have a two-year degree programme, institutions that have a four-year degree with a dedicated supply chain management major, and institutions that only have a four-year degree in operations research, management science, or industrial engineering. Institutions in the data set that had multiple types of programmes all had a four-year supply chain management programme (among others), so they were assigned to the four-year supply chain management group. At the graduate level, programme types were institutions that only have a general MBA programme, institutions that only have an MBA programme with a supply chain management concentration, and institutions that have a Master's of Science programme in either supply chain management or operations research, management science, or industrial engineering. Institutions with multiple programmes all had a Master's of Science programme (among others), so they were assigned to that group.

Figures 4 and 5 show the means of these coverage scores for each trend grouped by programme type at the undergraduate and graduate level, respectively.

The survey results segregated by programme type yielded some interesting insights. The more focused programmes – four-year undergraduate programmes with a supply chain management major and dedicated Master's of Science programmes at the graduate level – generally covered the trends to a greater extent than other programmes that are more general. These focused programmes have more credit hours in the curriculum to dedicate to supply chain management topics, which potentially gives them more time to discuss current trends. MBA programmes with a supply chain management concentration somewhat surprisingly also reported high levels of coverage of many of the trends. This can be challenging for instructors to accomplish due to the limited credit hours dedicated to supply chain management in those programmes. Also somewhat surprisingly, four-year programmes in operations research, management science, and industrial engineering showed relatively low coverage levels for many of the trends, especially those that are not technical in focus. This suggests a possible gap in the operations research, management science, and industrial engineering curricula and provides an opportunity for institutions to enhance their curricula by increasing the coverage of these trends to better prepare their students for industry challenges.

To compare the results and identify significant differences in the coverage of each trend by programme type, we conducted a one-way analysis of variance (ANOVA), which is appropriate

Trend	2 Yr Only (n = 4)	4 Yr SCM (n = 47)	4 Yr OR/MS/IE Only (n = 10)	F-Stat (*p*-value)
1-Advanced Analytics & Automation	2.25	2.94	3.00	1.36 (0.2654)
2-Talent Management	2.25	1.87	1.90	0.44 (0.6480)
3-Visibility	2.25	2.63	2.00	3.95 (0.0247**)
4-Rise of E-Commerce	2.50	2.89	2.60	1.19 (0.3101)
5-Supply Chain Agility	2.50	2.74	2.30	2.09 (0.1326)
6-Supply Chain Risk & Resilience	3.00	3.11	2.50	3.83 (0.0274**)
7-Digital Supply Chain	2.25	2.74	2.50	0.82 (0.4450)
8-Cybersecurity	2.25	2.41	1.70	2.13 (0.1285)
9-Customer-Centricity	2.75	2.66	2.30	1.07 (0.3511)
10-Artificial Intelligence	2.00	2.57	2.70	1.19 (0.3117)
11-Demand Sensing	2.00	2.51	2.30	0.83 (0.4391)
12-Corporate Citizenship (ESG)	2.75	2.94	2.30	4.12 (0.0213**)
13-Demographic Changes	1.75	1.93	1.70	0.59 (0.5590)
14-3D Printing	2.00	2.00	1.56	1.56 (0.2194)

Figure 4. Mean coverage scores for supply chain trends in undergraduate programmes by programme type. The number in front of the trend name represents its ranking on the list with 1 being the highest-ranked trend. Asterisks denote *p*-values that are significant at the 10% level (*), 5% level (**), and 1% level (***).

Trend	General MBA Only (n = 13)	MBA with SCM Only (n = 14)	MS in SCM or OR/MS/IE (n = 33)	F-Stat (*p*-value)
1-Advanced Analytics & Automation	2.17	3.14	3.41	11.19 (<0.0001***)
2-Talent Management	1.58	1.86	2.09	1.53 (0.2253)
3-Visibility	2.00	2.71	2.58	4.30 (0.0183**)
4-Rise of E-Commerce	2.31	2.71	2.76	1.57 (0.2174)
5-Supply Chain Agility	2.33	2.79	2.85	2.46 (0.0947*)
6-Supply Chain Risk & Resilience	2.42	3.14	2.97	4.40 (0.0168**)
7-Digital Supply Chain	1.92	2.57	3.00	8.59 (0.0006***)
8-Cybersecurity	1.75	2.50	2.09	1.77 (0.1801)
9-Customer-Centricity	2.27	2.64	2.45	0.66 (0.5212)
10-Artificial Intelligence	2.38	2.43	2.85	1.46 (0.2414)
11-Demand Sensing	1.75	2.93	2.75	7.64 (0.0012***)
12-Corporate Citizenship (ESG)	2.83	2.79	2.88	0.06 (0.9395)
13-Demographic Changes	1.69	2.07	1.88	0.79 (0.4608)
14-3D Printing	1.58	2.07	1.81	2.06 (0.1366)

Figure 5. Mean coverage scores for supply chain trends in graduate programmes by programme type. The number in front of the trend name represents its ranking on the list with 1 being the highest-ranked trend. Asterisks denote *p*-values that are significant at the 10% level (*), 5% level (**), and 1% level (***).

because the undergraduate and graduate data sets both included more than two programme types (Ross and Willson 2017). The *F*-statistics and corresponding *p*-values for each trend are provided in the last column of Figures 4 and 5. The undergraduate results (Figure 4) identified significant differences in the coverage of three trends – Visibility, Supply Chain Risk & Resilience, and Corporate Citizenship – at the 5% level. For each of these trends, the coverage within four-year operations research, management science, and industrial engineering programmes was less than that of the other two groups. The graduate analysis (Figure 5) found a higher number of significant differences than were evident in the undergraduate data. The differences in coverage between programmes for Advanced Analytics & Automation, Digital Supply Chain, and Demand Sensing were significant at the 1% level. Differences in coverage of Visibility and Supply Chain Risk & Resilience were significant at the 5% level, and the difference for Supply Chain Agility coverage was significant at the 10% level. For all these trends, the general MBA programmes had coverage that was much lower than that of the other programme types.

We also conducted a one-way ANOVA analysis to examine the survey results by programme size as shown in Figures 6 and 7. At both the undergraduate and graduate levels, larger programmes tended to exhibit higher degrees of coverage of most trends compared to smaller programmes, but this was not always the case. For example, undergraduate programmes with 50–100 students reported much higher coverage of Supply Chain Agility than any other size of undergraduate programme did. Similarly, graduate programmes with 101–200 students showed higher coverage of Talent Management than other programmes including those with more than 200 students.

Formal ANOVA analysis established similar results for differences in coverage scores by programme size at both the undergraduate and graduate levels. Differences between coverage scores by programme size for undergraduate programmes were significant at the 1% level for Visibility and Supply Chain Agility, at the 5% level for Advanced Analytics & Automation, and at the 10% level for Digital Supply Chain and Demand Sensing. For all these trends with significant differences in coverage, the group of programmes with fewer than 50 students all had lower scores than the larger programmes. At the graduate level, differences by programme size for Supply Chain Agility and Digital Supply Chain were significant at the 5% level, and differences for Talent Management,

Trend	< 50 (n = 27)	50 - 100 (n = 18)	101 - 200 (n = 12)	> 200 (n = 13)	F-Stat (*p*-value)
1-Advanced Analytics & Automation	2.54	2.94	2.73	3.38	3.13 (0.0316**)
2-Talent Management	1.77	1.61	2.09	2.08	1.53 (0.2145)
3-Visibility	2.00	2.56	2.36	2.85	4.78 (0.0046***)
4-Rise of E-Commerce	2.54	2.44	2.91	3.00	1.92 (0.1350)
5-Supply Chain Agility	2.15	3.06	2.55	2.69	8.00 (0.0001***)
6-Supply Chain Risk & Resilience	2.78	2.72	3.09	3.15	1.65 (0.1875)
7-Digital Supply Chain	2.40	2.56	2.64	3.15	2.24 (0.0918*)
8-Cybersecurity	2.12	2.50	1.91	2.46	1.03 (0.3835)
9-Customer-Centricity	2.33	2.50	2.36	2.77	1.05 (0.3775)
10-Artificial Intelligence	2.37	2.39	2.64	2.69	0.58 (0.6322)
11-Demand Sensing	2.07	2.56	2.55	2.69	2.29 (0.0864*)
12-Corporate Citizenship (ESG)	2.59	2.89	2.73	2.92	0.82 (0.4891)
13-Demographic Changes	1.72	1.83	2.09	1.69	0.85 (0.4733)
14-3D Printing	1.69	2.06	2.25	1.92	2.14 (0.1034)

Figure 6. Mean coverage scores for supply chain trends in undergraduate programmes by programme size. The number in front of the trend name represents its ranking on the list with 1 being the highest-ranked trend. Asterisks denote *p*-values that are significant at the 10% level (*), 5% level (**), and 1% level (***).

Rise of E-Commerce, and Demand Sensing were significant at the 10% level. Just as with the undergraduate responses, the programmes with fewer than 50 students had lower coverage scores for the trends with significant differences than the larger programmes except for Talent Management where the group with 50–100 students had a slightly lower score.

Figure 8 shows analysis of the results of independent sample *t*-tests comparing coverage of the trends in United States-based institutions with institutions in other countries at both the undergraduate and graduate levels. A *t*-test is appropriate here instead of ANOVA because there are only two groups–United States and other countries (Ross and Willson 2017). At the undergraduate level, the differences in coverage were significant for Digital Supply Chain and Artificial Intelligence at the 5% level. At the graduate level, the differences in coverage were significant for Digital Supply Chain at the 5% level and Supply Chain Agility, Artificial Intelligence, and Corporate Citizenship at

Trend	< 50 (n = 21)	50 - 100 (n = 15)	101 - 200 (n = 10)	> 200 (n = 13)	F-Stat (*p*-value)
1-Advanced Analytics & Automation	2.75	3.2	3.22	3.38	1.56 (0.2098)
2-Talent Management	1.80	1.60	2.50	2.00	2.41 (0.0766*)
3-Visibility	2.15	2.60	2.50	2.85	3.06 (0.0358**)
4-Rise of E-Commerce	2.33	2.60	3.00	2.92	2.39 (0.0781*)
5-Supply Chain Agility	2.35	2.93	2.80	3.00	3.23 (0.0293**)
6-Supply Chain Risk & Resilience	2.65	2.93	2.89	3.23	1.92 (0.1368)
7-Digital Supply Chain	2.40	2.47	2.80	3.23	2.97 (0.0400**)
8-Cybersecurity	1.90	2.33	2.00	2.23	0.59 (0.6262)
9-Customer-Centricity	2.30	2.50	2.60	2.54	0.40 (0.7501)
10-Artificial Intelligence	2.29	3.00	2.90	2.62	1.78 (0.1621)
11-Demand Sensing	2.15	2.71	2.80	2.92	2.40 (0.0782*)
12-Corporate Citizenship (ESG)	2.55	3.00	3.00	2.92	1.21 (0.3165)
13-Demographic Changes	1.76	1.93	2.20	1.69	1.00 (0.4006)
14-3D Printing	1.75	1.87	2.11	1.69	0.92 (0.4363)

Figure 7. Mean coverage scores for supply chain trends in graduate programmes by programme size. The number in front of the trend name represents its ranking on the list with 1 being the highest-ranked trend. Asterisks denote *p*-values that are significant at the 10% level (*), 5% level (**), and 1% level (***).

	Undergraduate			Graduate		
Trend	US (n = 45)	International (n = 20)	*t*-Stat (*p*-value)	US (n = 38)	International (n = 15)	*t*-Stat (*p*-value)
1-Advanced Analytics & Automation	2.91	2.68	0.97 (0.3381)	3.11	3.07	0.10 (0.9208)
2-Talent Management	1.82	1.89	-0.32 (0.7521)	1.82	2.27	-1.45 (0.1613)
3-Visibility	2.44	2.33	0.54 (.5906)	2.55	2.33	0.92 (0.3675)
4-Rise of E-Commerce	2.62	2.84	-1.01 (0.3155)	2.68	2.67	0.07 (0.9453)
5-Supply Chain Agility	2.62	2.42	1.13 (0.2659)	2.66	3.07	-1.78 (0.0900*)
6-Supply Chain Risk & Resilience	2.87	3.05	-1.17 (0.2473)	2.92	2.93	-0.04 (0.9696)
7-Digital Supply Chain	2.47	3.06	-2.54 (0.0136**)	2.55	3.13	-2.36 (0.0220**)
8-Cybersecurity	2.36	2.22	0.43 (0.6733)	2.16	2.00	0.51 (0.6139)
9-Customer-Centricity	2.53	2.37	0.97 (0.3345)	2.53	2.40	0.48 (0.6390)
10-Artificial Intelligence	2.33	2.89	-2.44 (0.0175**)	2.53	3.13	-1.86 (0.0767*)
11-Demand Sensing	2.47	2.21	1.11 (0.2726)	2.62	2.60	0.08 (0.9405)
12-Corporate Citizenship (ESG)	2.73	2.84	-0.53 (0.6003)	2.66	3.20	-2.02 (0.0567*)
13-Demographic Changes	1.78	1.94	-0.79 (0.4379)	1.84	1.93	-0.32 (0.7553)
14-3D Printing	1.91	1.95	-0.21 (0.8349)	1.79	1.86	-0.34 (0.7338)

Figure 8. Mean coverage scores for supply chain trends in United States and international undergraduate and graduate programmes. The number in front of the trend name represents its ranking on the list with 1 being the highest-ranked trend. Asterisks denote *p*-values that are significant at the 10% level (*), 5% level (**), and 1% level (***).

the 10% level. For each trend with significant differences, the international score was always higher than the United States score, suggesting that international programmes exhibit a higher level of coverage of these trends than their United States counterparts.

We analysed another interesting comparison in the survey data between the mean coverage scores for each trend in undergraduate and graduate programmes. We conducted independent sample *t*-tests of the differences in population mean coverage scores for each trend using the 76 undergraduate and 60 graduate observations. No differences were found to be significant at even the 10% level. Many institutions responded to the survey with both their undergraduate and graduate programme coverage. It is natural for programmes at the same institution to have similar curricula, but it is also reasonable that the extent to which certain topics are covered could differ between undergraduate and graduate courses due to factors such as available credit hours in the programme and required prerequisites. These survey results were not able to identify a significant difference in coverage between the levels of education for these trends.

Recommendations for updating academic programs

The discipline of supply chain management is both relatively new and with a broader attention and growing expectations is changing rapidly. Updating courses and curriculum to keep current in such an environment can be challenging, yet critically important for properly preparing students for success as well as compliance with accreditation standards. The AACSB Standard 4: 4-1 states that schools should deliver 'content that is current, relevant, forward-looking, globally-oriented, aligned with programme competency goals, and consistent with its mission, strategies, and expected outcomes. The curriculum content cultivates agility with current and emerging technologies' (AASCB 2022). Benchmarking curricula over time against the top trends in supply chain management is one way to verify curricula are current, relevant, globally-oriented, and aligned with programme competency goals.

To no surprise, the top 10 trends in supply chain management evolve and change every year. To warrant inclusion or extent of inclusion in a course or across the supply chain management curriculum, those topics that evolve and stay in the top trends are most important to consider in curriculums. As previously mentioned, this was the reason for including the four trends that just missed making the 2022 top 10, as these may have appeared over sequential past trends or are emerging and need to be considered.

The survey responses show that the majority both undergraduate and graduate programmes do include coverage of many of these top supply chain trends. While often academic programmes inherently lag industry developments in their coverage of emerging topics, the coverage reported by the survey respondents seems to be far greater than we initially expected with at least 60% of all programmes including all these topics in their courses and curriculum. There are a variety of explanations for this good news. First, courses are no longer solely dependent on textbooks for coverage of subject matter. With the broad adoption of learning management systems in higher education combined with access to broader resources including open educational resource (OER) textbook solutions, faculty have many alternatives to traditional textbooks (Dennen and Bagdy 2019). With a textbook revision cycle of 2–3 years, this historically assured the same lag in integrating new concepts into courses and pedagogy. Interest, discussion, and publications on supply chain issues are easy to find and make relating course content to real-world situations easier for instructors than ever before. Utilising online learning management systems has also made sharing current articles, webinars, videos, websites and other currently available digital media much easier (Mishra, Gupta, and Shree 2020). In fact, if a recent article on important topics is published, it can be immediately shared with students, helping them to both learn and connect these important topics with practice (Bhagat and Kim 2020). A benefit of the shift to online learning prompted by the recent pandemic is the use of video platforms such as Zoom and Microsoft Teams to easily invite guest speakers from around the world with expertise on emerging topics into the classroom (Johnson and Pyke 2000; Satir 2008).

One important question for further research and analysis is if faculty understanding and coverage of these topics are consistent with current practice. For example, it is no surprise that Advanced Analytics & Automation was ranked highest in the top 10 trends list, and it also ranked highest with respect to having at least some coverage in supply chain programmes as shown in Figures 2 and 3. Analytics is sometimes defined as narrowly as the use of statistics, mathematics, and computer software. As such, nearly every business major has a minimal core requirement of basic statistics and therefore analytics according to that narrow definition. While this study did not specifically determine whether the required analytics courses were specifically taught by the supply chain faculty, the majority of respondents indicated these topics were covered in their respective curricula. This is not surprising as the importance of the coverage of analytics in supply chain curriculum has long been recognised (Kumar, Shrivastav, and Oberoi 2021; Sinha, Millhiser, and He 2016). In the most limited sense, having only a single course coverage of basic statistics falls into the category of an analytics course; however, this does not sufficiently address the current analytics and automation trend according to the ASCM list. Specifically, understanding of big data management and analysis methodology is essential. Advanced analytics tools to handle big data such as R, Python, Lumify, Apache Hadoop, MongoDB, RapidMiner, Apache Spark, Microsoft Azure, Zoho Analytics, Xplenty, or Splice Machine are important skills to prepare supply chain management students for successful careers (Darvazeh, Vanani, and Musolu 2020; Nguyen et al. 2018). A selection of these topics can be covered in a second required major-specific analytics course beyond basic statistics.

Another supply chain management trend on the ASCM list with significant curricular coverage is Corporate Citizenship, with approximately 95% of programmes covering the topic at minimum in at least one course. While this was only ranked 12th on the list, respondents indicated coverage likely as a result of the push by AACSB for ethics education in the business school curriculum as well as part of the accreditation standards since 2004 (AACSB 2004). Corporate citizenship does include ethical leadership; however, current educational emphasis must also include environmental, social, and corporate governance (ESG). Covering these concepts directly relates to the role of supply chain structure in influencing supply chain transparency and is beneficial for supply chain management programmes as well as any business major (Gualandris et al. 2021). As such, these important topics can be included in a business core curriculum such as in an international business course where students can learn about the United Nations' Sustainable Development

Goals as well as environmental responsibility and human rights (UN 2010, 2017). Consumers continue to increase pressure on organisations to source and manufacture their products using ethical and sustainable practices. This customer desire combined with ever-increasing supply chain transparency means that future supply chain leaders must understand and have an ability to validate sustainable practices throughout their supply chains (Gualandris et al. 2021).

The topic with the broadest coverage both at the graduate and undergraduate levels was Supply Chain Risk & Resilience. While Advanced Analytics & Automation had more programmes with a dedicated course on the topic, the Supply Chain Risk & Resilience topic is covered in a minimum of one course in at least 95% of both graduate and undergraduate supply chain curricula. The topic of Supply Chain Risk & Resilience is highly overlapping with Supply Chain Agility, as agile companies are also more responsive. The coverage of supply chain disruptions has become more commonplace in recent years, especially those related to the COVID pandemic shutdowns. Ferguson and Drake (2021) note, however, that the majority of textbooks commonly used in supply chain management courses at the start of the pandemic had little if any coverage of supply chain risk management. In response to this deficiency, they created a classroom reading and exercise focused on the toilet paper shortage experienced at the start of the pandemic. Many other articles and videos discussing COVID-related disruptions, their impact, and the underlying causes have been published as these disruptions have directly affected individual consumers (McLain, Matthews, and Paris 2021; Tirschwell 2021). Such articles and videos not only generate more interest from students to consider pursuing careers in supply chain management; they provide rich resources to instructors and academic programmes for learning and discussions. Students can easily relate to the impact of toilet paper shortages, which faculty can use as a great real-world example of the bullwhip effect and discuss how to better mitigate its impact through supply chain transparency, communication, and changes directed at limiting panic buying. Assessing supply chains for vulnerabilities as well as implementing strategies to respond to these disruptions more effectively is essential knowledge for future supply chain leaders.

Several top trends are far more technical in nature such as Cybersecurity, Artificial Intelligence (AI), and 3D Printing. While many programmes discuss AI as a topic in at least one course, it is likely that discussion is more about how AI's growing application to forecasting, demand management, planning, and order fulfilment rather than creating and programming AI algorithms and applications. This type of coverage of the application rather than development and programming is also the likely explanation of why the majority of programmes cover Cybersecurity and 3D Printing as a topic in one course. More in-depth coverage of these topics could be covered through supply chain programmes partnering with computer science or engineering programmes where offerings of stand-alone courses on these topics are far more likely. Allowing interested majors to take elective courses on these topics outside the supply chain management programme provides choices to students interested in advancing their knowledge on these topics without the need to hire additional faculty with such specialised knowledge. Instructors could also utilise teaching cases discussing the business value or implications of the technology to increase the coverage of some of these topics. Teaching cases provide an opportunity to integrate emerging topics that are not yet in textbooks into the classroom and have the additional benefit of teaching notes and suggestions to help instructors use the materials effectively (Drake 2019).

To no surprise, few programmes and curricula indicated significant coverage of Supply Chain Talent Management, as academic programmes themselves are specifically focused on developing that future supply chain talent. Students should develop an understanding of the importance of developing and retaining key supply chain talent in their organisations as they start their careers. It is important, however, to consider that career success in the dynamic field of supply chain management requires life-long education and learning not only for individuals, but for these future supply chain managers in developing their own people (Sinha, Millhiser, and He 2016). Formal awareness of and involvement with professional associations within the supply chain field such as the Association for Supply Chain Management (ASCM), Institute for Supply Management

(ISM), or Council of Supply Chain Management Professionals (CSCMP) is beneficial for both students and programmes (Fawcett and Rutner 2014; Quinn 2005; Sinha, Millhiser, and He 2016). These associations provide resources in ongoing education, professional certifications, and engagement with supply chain professionals worldwide so that individuals can remain current in their profession as well as resources to educate their employees with requisite skills and capabilities when they become leaders in their organisations. Professional certifications such as Certified in Planning and Inventory Management (CPIM), Certified Supply Chain Professional (CSCP), Certified in Logistics, Transportation, and Distribution (CLTD), and Certified Professional in Supply Management (CPSM) all undergo frequent benchmarking of exam content used by supply chain professionals through the job task analysis process.

Demographic Changes was also a top trend topic that had little coverage in supply chain management programmes at both graduate and undergraduate levels beyond at most some brief coverage in one course in the curriculum. While it ranked only 13th in the 2022 ASCM list, student knowledge of these demographic shifts could be of strategic importance, especially for graduate students moving into leadership positions. Anticipating changes in demand prompted by declining birth rates, aging populations, and migration will likely be increasingly important both for changes in product/service demands as well as decisions on future expansion (Boone et al. 2019). Many AACSB-accredited programmes include a required core course in international business. Including a module covering these trends and global shifts would benefit supply chain management as well as all business majors. Programmes could also look at developing study abroad programmes for supply chain students to enable them to experience the global supply chain first-hand (Drake, Luchs, and Mawhinney 2015).

Faculty and programmes are expected more than ever to update their courses and curriculum to better prepare future graduates for successful careers. Fortunately, digital access to more resources makes this challenge easier to overcome. It is also important to recognise that with more topics added to the curriculum, there often is insufficient time to cover everything that we have traditionally covered in the past (Visich and Khumawala 2006). Making evolutionary ongoing changes versus revolutionary complete curriculum revisions is a more manageable strategy (Ellahi, Khan, and Shah 2019; Mohamed 2009; Walden 2020). Awareness of emerging topics and access to teaching resources on those topics is necessary. For faculty members, questioning the necessity of covering long standing topics is difficult as those teaching and assessment materials are well developed and faculty are comfortable with teaching the content. Newer topics, however, can generate interest and engage both faculty and students. Sharing innovative teaching materials and methods through journal articles, academic conferences, publisher websites, and through supply chain associations can help. Instructors who engage in pedagogical research to develop innovative teaching materials can look at the coverage gaps identified in this study to target specific topics for new teaching materials that provide a way for the academic community to integrate these important but underrepresented trends into the supply chain management curriculum.

Concluding remarks

The survey results analysed and discussed in this article represent an important first step in assessing the curricula of supply chain academic programmes to determine if they are teaching the 'right' topics, concepts, and methods. Utilising resources such as the annual ASCM Top 10 Trends in Supply Chain Management list (James 2021) provides supply chain management faculty and programmes with an unbiased reference of current topics that will help to prepare their future graduates for the workplace. This study provides an initial benchmark that programmes can use to assess their coverage of these trends relative to similar programmes and determine any gaps in coverage that should be closed or existing comparative advantages that could be emphasised to recruit new students and employers. Researchers are encouraged to expand upon this study by evaluating the

evolution of the adoption of these trends into curricula over time and well as examining the way in which these trends were incorporated into curricula by looking at the time spent covering them in courses and the methods used to discuss them (such as articles, videos, guest speakers, case studies, etc.).

The ASCM trend list is updated annually, enabling programmes to continue to monitor emerging industry trends relative to their curriculum coverage. Even though the updated list identifies a new set of top trends each year, trends that appeared in previous years are often captured or reconstituted within new trends on the list or are rated highly overall but just outside the top 10. Eventually, some trends become so entrenched in the field that they are no longer emerging but are incorporated into standard business practice and thus should be covered in academic curricula. Faculty and programmes should also consider the implementation of these topics into their curricula based on the needs of the main industries operating in the vicinity of their respective institutions (Visich and Khumawala 2006).

Monitoring course and programme content and making incremental adjustments over time is often more effective than major curricular revisions (Ellahi, Khan, and Shah 2019; Mohamed 2009). Furthermore, the necessity of a major revision likely means that the majority of current content, while historically important, is far less valuable in preparing future graduates. It is also important that faculty teaching in the programme collaborate to make decisions on which and the amount new content to be included. This is especially important in aligning with faculty interest and expertise (Mohamed 2009). Furthermore, as content grows sufficient to warrant consideration of a standalone course, such as advanced analytics, the collective wisdom and agreement of faculty is critically important (Kumar, Shrivastav, and Oberoi 2021).

Unlike other disciplines that have been well-established for many more decades, the relatively recent development, interest, and growth in the field of supply chain management creates more opportunities for a misalignment between the topics taught in programmes and knowledge needed in practice (Fawcett and Rutner 2014; Sinha, Millhiser, and He 2016). Faculty members who remain complacent in teaching the same content not only are losing professional relevance, but they miss both new research opportunities as well as topics that excite and engage their students. Professional associations recognise the mutual benefit of growing relationships with academic faculty and programmes. As such, they often offer discounted or free academic membership as well as access to significant resources to help faculty maintain currency of course content. The ability for faculty to publish and share digital access to pedagogical resources makes integrating emerging topics less challenging than ever before.

Faculty can no longer solely rely on revisions of textbooks and their supporting ancillary materials to keep current in the classroom (Mohamed 2009). This is particularly important in fields such as supply chain management which are affected by rapid changes and evolution (van Hoek 2001). Balancing teaching foundational concepts such as the bullwhip effect and inventory control versus repurposing old content rather than replacing it is a difficult decision. Many articles found in the popular media, such as the *Wall Street Journal*, make great classroom discussion and case studies in the application of concepts (Johnson and Pyke 2000; Sinha, Millhiser, and He 2016). Furthermore, they can serve as context for the application of concepts learned for student homework, papers, or assessment of learning. Teaching cases provide another opportunity for instructors to supplement traditional concepts in textbooks with emerging topics and considerations (Drake 2019; van Hoek 2001).

While most supply chain management programmes have benefited significantly from the demand of graduates exceeding supply, distinguishing one's supply chain programme based on the relevant knowledge and performance of graduates will increasingly be important. Benchmarking programme curricula against the top trends and aligning content coverage with professional expectations in the marketplace will assure the success and prestige of supply chain management programmes in the future.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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References

AACSB. 2004. "Ethics Education in Business Schools: Report of the Ethics Education Task Force to AACSB International's Board of Directors." Tampa, FL: AACSB International – The Association to Advance Collegiate Schools of Business. https://www.aacsb.edu/-/media/publications/research-reports/ethics-education.pdf?la=en.

AACSB. 2022. "2020 Guiding Principles and Standards for Business Accreditation." https://www.aacsb.edu/-/media/documents/accreditation/2020-aacsb-business-accreditation-standards-july-2021.pdf?rev=64fccbbef854490c9c5c3b8e8bd7f7dd.

Ackoff, R. L. 1979. "The Future of Operational Research is Past." *Journal of the Operational Research Society* 30 (2): 93–104. https://doi.org/10.1057/jors.1979.22.

Akalin, G. I., Z. Huang, and J. R. Willems. 2016. "Is Supply Chain Management Replacing Operations Management in the Business Core Curriculum?" *Operations and Supply Chain Management* 9 (2): 119–130. http://doi.org/10.31387/oscm0240166.

Alipour, P., and K. Newton. 2019. "Development of Curriculum in Technology-related Supply Chain Management Programs." 2019 American Society for Engineering Education Annual Conference & Exposition Proceedings, Tampa, FL. https://peer.asee.org/32655.

ASCM. 2023. *2023 Supply Chain Salary and Career Report*. Chicago, IL: Association for Supply Chain Management. https://www.ascm.org/making-an-impact/research/salary-survey/.

Banker, S. 2022. "Top Supply Chain Trends Heading into 2023." *Forbes*, November 2.

Bernon, M., and C. Mena. 2013. "The Evolution of Customised Executive Education in Supply Chain Management." *Supply Chain Management: An International Journal* 18 (4): 440–454. https://doi.org/10.1108/SCM-07-2012-0262.

Bhagat, S., and D. J. Kim. 2020. "Higher Education Amidst COVID-19: Challenges and Silver Lining." *Information Systems Management* 37 (4): 366–371. https://doi.org/10.1080/10580530.2020.1824040.

Birou, L., H. Lutz, and J. L. Walden. 2022. "Undergraduate Supply Chain Management Courses: Content, Coverage, Assessment and Gaps." *Supply Chain Management: An International Journal* 27 (1): 1–11. https://doi.org/10.1108/SCM-07-2012-0262.

Boone, T., R. Ganeshan, A. Jain, and N. Sanders. 2019. "Forecasting Sales in the Supply Chain: Consumer Analytics in the Big Data Era." *International Journal of Forecasting* 35: 170–180. https://doi.org/10.1016/j.ijforecast.2018.09.003.

Brightman, H., and C. Noble. 1979. "On the Ineffective Education of Decision Scientists." *Decision Sciences* 10 (1): 151–157. https://doi.org/10.1111/j.1540-5915.1979.tb00014.x.

Campbell, A., J. Goentzel, and M. Savelsbergh. 2000. "Experiences with the Use of Supply Chain Management Software in Education." *Production and Operations Management* 9 (1): 66–80. https://doi.org/10.1111/j.1937-5956.2000.tb00324.x.

Chen, F., and R. Samroengraja. 2000. "The Stationary Beer Game." *Production and Operations Management* 9 (1): 19–30. https://doi.org/10.1111/j.1937-5956.2000.tb00320.x.

Coleman, B. J., and S. J. Smith. 1994. "A Proposed Typology for the Production and Operations Management Core Course." *Journal of Management Education* 18 (3): 332–341. https://doi.org/10.1177/105256299401800305.

Coye, R. W., and P. W. Stonebraker. 1994. "The Effectiveness of Personal Computers in Operations ManagementEducation." *International Journal of Operations & Production Management* 14 (12): 35–46. https://doi.org/10.1108/01443579410072364.

Darvazeh, S. S., I. R. Vanani, and F. M. Musolu. 2020. "Big Data Analytics and its Applications in Supply Chain Management." In *New Trends in the Use of Artificial Intelligence for the Industry 4.0*, edited by L. R. Martinez, R. A. O. Rios, and M. D. Prieto, 175–200. London: IntechOpen.

Delgado, M., and K. Mills. 2018. "The Supply Chain Economy and the Future of Good Jobs in America." *Harvard Business Review*, March 9. https://hbr.org/2018/03/the-supply-chain-economy-and-the-future-of-good-jobs-in-america.

Dennen, V. P., and L. M. Bagdy. 2019. "From Proprietary Textbook to Custom OER Solution: Using Learner Feedback to Guide Design and Development." *Online Learning* 23 (3): 4–20. https://doi.org/10.24059/olj.v23i3.2068.

Desai, K., and R. A. Inman. 1994. "Student Bias Against POM Coursework and Manufacturing." *International Journal of Operations & Production Management* 14 (8): 70–87. https://doi.org/10.1108/01443579410067144.

Drake, M. 2012. *Global Supply Chain Management*. New York: Business Expert Press.

Drake, M. J. 2019. "Teaching OR/MS with Cases: A Review and new Suggestions." *INFORMS Transactions on Education* 19 (2): 57–66. https://doi.org/10.1287/ited.2018.0204.

Drake, M. J., R. J. Luchs, and J. R. Mawhinney. 2015. "International Supply Chain Management Courses: Semester-Long Versus Study-Abroad Formats." *Journal of Teaching in International Business* 26 (3): 164–176. https://doi.org/10.1080/08975930.2015.1081842.

Ellahi, R. M., M. U. A. Khan, and A. Shah. 2019. "Redesigning Curriculum in Line with Industry 4.0." In *Proceedings of the 2nd International Conference on Emerging Data and Industry 4.0*, 699–708. Leuven. https://doi.org/10.1016/j.procs.2019.04.093.

Fawcett, S. E. 2009. "An Update on the State of Supply Chain Education." *Supply Chain Management Review* 13 (6): 36–42.

Fawcett, S. E., and S. M. Rutner. 2014. "A Longitudinal View of Supply Chain Education: Assessing the Challenge of Retaining Relevance in Today's Dynamic Marketplace." *International Journal of Logistics Management* 25 (1): 180–201. https://doi.org/10.1108/IJLM-07-2012-0061.

Ferguson, M. E., and M. J. Drake. 2021. "Teaching Supply Chain Risk Management in the COVID-19 Age: A Review and Classroom Exercise." *Decision Sciences Journal of Innovative Education* 19 (1): 5–14. https://doi.org/10.1111/dsji.12230.

Ford, H., and S. Crowther. 1926. *Today and Tomorrow*. New York: Doubleday, Page & Co.

Forrester, J. W. 1958. "Industrial Dynamics: A Major Breakthrough for Decision Makers." *Harvard Business Review* 36 (4): 37–66.

Friga, R. N., R. A. Bettis, and R. S. Sullivan. 2003. "Changes in Graduate Management Education and new Business School Strategies for the 21st Century." *Academy of Management Learning & Education* 2 (3): 233–249. https://doi.org/10.5465/amle.2003.10932123.

Gartner. 2022. *The Top 8 Supply Chain Technology Trends*. Gartner, Inc. https://emtemp.gcom.cloud/ngw/globalassets/en/supply-chain/documents/trends/the-top-8-supply-chain-technology-trends.pdf.

Gibson, T., D. Kerr, and R. Fisher. 2016. "Accelerating Supply Chain Management Learning: Identifying Enablers from a University-Industry Collaboration." *Supply Chain Management: An International Journal* 21 (4): 470–484. https://doi.org/10.1108/SCM-10-2014-0343.

Grey, C. 2002. "What are Business Schools for? On Silence and Voice in Management Education." *Journal of Management Education* 26 (5): 496–511. https://doi.org/10.1177/105256202236723.

Gualandris, J., A. Longoni, D. Luzzini, and M. Pagell. 2021. "The Association Between Supply Chain Structure and Transparency: A Large-Scale Empirical Study." *Journal of Operations Management* 67 (7): 803–827. https://doi.org/10.1002/joom.1150.

Henrich, J., J. Li, C. Mazuera, and F. Perez. 2022. "Future-proofing the Supply Chain." Mckinsey & Company, June 14. https://doi.org/10.1002/joom.1150.

James, A. 2021. "10 Supply Chain Trends to Watch for in 2022." *ASCM Insights*. www.ascm.org/ascm-insights/10-supply-chain-trends-to-watch-for-in-2022/.

Johnson, M. E., and D. F. Pyke. 2000. "A Framework for Teaching Supply Chain Management." *Production and Operations Management* 9 (1): 2–18. https://doi.org/10.1111/j.1937-5956.2000.tb00319.x.

Jordan, C., and O. Bak. 2016. "The Growing Scale and Scope of the Supply Chain: A Reflection on Supply Chain Graduate Skills." *Supply Chain Management: An International Journal* 21 (5): 610–626. https://doi.org/10.1108/SCM-02-2016-0059.

Kendall, M. G. 1958. "The Teaching of Operational Research: Presidential Address to the Operational Research Society on 23 October 1958." *Journal of the Operational Research Society* 9 (4): 265–278. https://doi.org/10.1057/jors.1958.33.

Kopczak, L. R., and J. C. Fransoo. 2000. "Teaching Supply Chain Management Through Global Projects with Global Project Teams." *Production and Operations Management* 9 (1): 91–104. https://doi.org/10.1111/j.1937-5956.2000.tb00326.x.

KPMG. 2021. "Six Key Trends Impacting Global Supply Chains in 2022." https://home.kpmg/xx/en/home/insights/2021/12/six-key-trends-impacting-global-supply-chains-in-2022.html.

Kumar, A., S. K. Shrivastav, and S. S. Oberoi. 2021. "Application of Analytics in Supply Chain Management from Industry and Academic Perspective." *FIIB Business Review*, https://doi.org/10.1177/23197145211028041.

Kwong, K. K., C. Hiranyavasit, and W. M. Fok. 1989. "An Effective Approach to Enhance Production and Operations Management Education in Colleges of Business." *Education and Computing* 5 (3): 181–188. https://doi.org/10.1016/S0167-9287(89)80041-X.

LaForge, R. L., and C. W. McNichols. 1989. "An Integrative, Experiential Approach to Production Management Education." *Decision Sciences* 20 (1): 198–207. https://doi.org/10.1111/j.1540-5915.1989.tb01407.x.
Lancioni, R., H. Forman, and M. Smith. 2001. "Logistics Programs in Universities: Stovepipe vs Cross Disciplinary." *International Journal of Physical Distribution & Logistics Management* 31 (1): 53–64. https://doi.org/10.1108/09600030110366429.
Laseter, T., and K. Oliver. 2003. "When Will Supply Chain Management Grow Up?" *Strategy and Business* 32: 20–25. https://doi.org/10.1108/09600030110366429.
Lebovitz, R. 2021. "The Big Supply Chain Talent Shortage." *Future of Sourcing*, June 3. https://futureofsourcing.com/the-big-supply-chain-talent-shortage.
Li, L. 2020. "Education Supply Chain in the Era of Industry 4.0." *Systems Research and Behavioral Science* 37: 579–592. https://doi.org/10.1002/sres.2702.
Lorentz, H., J. Toyli, T. Solakivi, and L. Ojala. 2013. "Priorities and Determinants for Supply Chain Management Skills Development in Manufacturing Firms." *Supply Chain Management: An International Journal* 18 (4): 358–375. https://doi.org/10.1108/SCM-03-2012-0111.
Lovejoy, W. S. 1998. "Integrated Operations: A Proposal for Operations Management Teaching and Research." *Production and Operations Management* 7 (2): 106–124. https://doi.org/10.1111/j.1937-5956.1998.tb00443.x.
Lutz, H., and L. Birou. 2013. "Logistics Education: A Look at the Current State of the Art and Science." *Supply Chain Management: An International Journal* 18 (4): 455–467. https://doi.org/10.1108/SCM-08-2012-0269.
McLain, S., C. M. Matthews, and C. Paris. 2021. "Everywhere You Look, the Global Supply Chain is a Mess." *Wall Street Journal*, March 18.
Mehring, J. S. 2000. "A Practical Setting for Experiential Learning About Supply Chains: Siemens Brief Case Game Supply Chain Simulator." *Production and Operations Management* 9 (1): 56–65. https://doi.org/10.1111/j.1937-5956.2000.tb00323.x.
Melnyk, S. A., and C. M. Seftel. 2016. "Myths and Truths: Misadventures in Supply Chain Management." *Supply Chain Management Review* 20 (1): 10–15.
Mentzer, J. T., W. Dewitt, J. S. Keebler, S. Min, N. W. Nix, C. D. Smith, and Z. G. Zacharia. 2001. "Defining Supply Chain Management." *Journal of Business Logistics* 22 (2): 1–25. https://doi.org/10.1002/j.2158-1592.2001.tb00001.x.
Mishra, L., T. Gupta, and A. Shree. 2020. "Online Teaching-Learning in Higher Education During Lockdown Period of COVID-19 Pandemic." *International Journal of Educational Research Open* 1: 100012. https://doi.org/10.1016/j.ijedro.2020.100012.
Mohamed, E. K. A. 2009. "Optimizing Business Education: A Strategic Response to Global Challenges." *Education, Business and Society: Contemporary Middle Eastern Issues* 2 (4): 299–311. https://doi.org/10.1108/17537980911001125.
Nguyen, T., L. Zhou, V. Spiegler, P. Ieromonachou, and Y. Lin. 2018. "Big Data Analytics in Supply Chain Management: A State-of-the-art Literature Review." *Computers & Operations Research* 98: 254–264. https://doi.org/10.1016/j.cor.2017.07.004.
Quinn, F. 2005. "Education: Keep it Relevant." *Supply Chain Management Review* 9 (6): 5.
Radovilsky, Z., and V. Hegde. 2012. "Trends in Supply Chain Management Job Requirements: A Longitudinal Study." *Journal of Supply Chain and Operations Management* 10 (1): 168–181.
Rawles, P., A. Smith, R. Hansen, and J. Sprankle. 2009. "Revising a Network Engineering Curriculum to Reflect Current Industry and Student Trends." 2009 American Society for Engineering Education Annual Conference & Exposition Proceedings, Austin, TX, https://peer.asee.org/5362.
Ross, A., and V. L. Willson. 2017. *Basic and Advanced Statistical Tests*. Rotterdam: SensePublishers, 21–24.
Satir, A. 2008. "Curriculum Design in Supply Chain Management." *International Journal of Information and Operations Management Education* 2 (3): 291–301. https://doi.org/10.1504/IJIOME.2008.019651.
Sauber, M. H., H. B. McSurely, and V. M. R. Tummala. 2008. "Developing Supply Chain Management Program: A Competency Model." *Quality Assurance in Education* 16 (4): 375–391. https://doi.org/10.1504/IJIOME.2008.019651.
Sauter, V. L. 1984. "MS/OR Education: Quality of an Operations Management Course: An Examination of the Effects of Prerequisites and Their Transfer." *Interfaces* 14 (4): 88–92. https://doi.org/10.1287/inte.14.4.88.
Sinha, A., W. P. Millhiser, and Y. He. 2016. "Matching Supply with Demand in Supply Chain Management Education." *International Journal of Logistics Management* 27 (3): 837–861. https://doi.org/10.1108/IJLM-03-2015-0058.
Sohal, A. S. 2013. "Developing Competencies of Supply Chain Professionals in Australia: Collaboration Between Businesses, Universities, and Industry Associations." *Supply Chain Management: An International Journal* 18 (4): 429–439. https://doi.org/10.1108/SCM-07-2012-0228.
Starr, M. K. 1997. "Pedagogical Challenge: Teaching International Production and Operations Management Courses." *Production and Operations Management* 6 (2): 114–121. https://doi.org/10.1111/j.1937-5956.1997.tb00420.x.
Taylor, F W. 1911. *The Principles of Scientific Management*. New York: Harper and Brothers.

Tirschwell, P. 2021. "Behind Your Long Wait for Packages." *Wall Street Journal*, June 2.
UN. 2010. "UN Global Compact Management Model: Framework for Implementation." United Nations Global Compact and Deloitte. https://d306pr3pise04h.cloudfront.net/docs/news_events%2F9.1_news_archives%2F2010_06_17%2FUN_Global_Compact_Management_Model.pdf.
UN. 2017. "Guide to Corporate Sustainability: Shaping a Sustainable Future." United Nations Global Compact. https://d306pr3pise04h.cloudfront.net/docs/publications%2FUN_Global_Compact_Guide_to_Corporate_Sustainability.pdf.
van Hoek, R. I. 2001. "Logistics Education: Achieving Market and Research Driven Skill Development." *International Journal of Physical Distribution & Logistics Management* 31 (7/8): 505–519. https://doi.org/10.1108/EUM0000000005906.
Visich, J. K., and B. M. Khumawala. 2006. "Operations Management Curricula: Literature Review and Analysis." *Journal of Statistics and Management Systems* 9 (3): 661–687. https://doi.org/10.1080/09720510.2006.10701229.
Vollmann, T. E., C. Cordon, and J. Heikkila. 2000. "Teaching Supply Chain Management to Business Executives." *Production and Operations Management* 9 (1): 81–90. https://doi.org/10.1111/j.1937-5956.2000.tb00325.x.
Walden, J. 2020. "Supply Chain Management Systems and Curriculum Reviews: What are we Teaching About Supply Chain Management Systems? Do We Need to Modify our Curriculums?" *International Journal of Contemporary Education* 3 (2): 1–10. https://doi.org/10.11114/ijce.v3i2.4861.
Webster, F. E., Jr. 1992. "The Changing Role of Marketing in the Corporation." *Journal of Marketing* 56 (4): 1–17. https://doi.org/10.1177/002224299205600402.
Xie, C., and S. D. Steiner. 2013. "Enhancing Management Education Relevance: Joint Creation of Knowledge Between Business Schools and Businesses." *Business Education & Accreditation* 5 (2): 1–15.
Zanakis, S. H., L. M. Austin, D. C. Nowading, and E. A. Silver. 1980. "From Teaching to Implementing Inventory Management: Problems of Translation." *Interfaces* 10 (6): 103–110. http://doi.org/10.1287/inte.10.6.103.